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ABSTRACT

To investigate the ability of 48 blind and partially sighted children (8 to 10 and 12 to 14 years old) to assume the upright position, Ss were given six trials in which they were requested to move themselves from a tilted starting position in a specially constructed chair to an upright position. No significant differences were found between three visual groups (totally blind, legally blind, and sighted) in the ability to assume the upright position. Findings suggested that the ability to judge the upright may be a postadolescent development. The possibility of moving the chair to the right and left many times in small increments as if to "zero in" on the upright position is suggested as an approach to mobility training. (CL)

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THE ABILITY TO ASSUME THE UPRIGHT POSITION IN BLIND AND SIGHTED CHILDREN

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The Ability to Assume the Upright Position in Blind and Sighted Children

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Running Head: Ability to Assume Upright

Abstract

The purpose of this study was to investigate blind and sighted children's ability to assume the upright position. This ability is of particular importance to posture and mobility for the blind. Forty-eight children in the age ranges 8-10 years and 12-14 years made up the following visual categories: totally blind, legally blind and sighted. A chair was developed which fit securely onto a balancing platform (known as a stabilometer). The platform could be moved by means of a hand control through a range of 20 degrees, 10 degrees each to the right and left. The children were all blindfolded during testing. Each child was given six trials in which he was requested to move himself from the tilted starting position in the chair (alternately left, then right) to the upright position. No significant differences were found between the visual groups in the ability to assume the upright position. Previous research had shown that the blind perform poorer than sighted blindfolded individuals in judging the upright position. No testing has been reported on this ability in children. The present findings suggest that the ability to judge the upright may be a post-adolescent development. A possible strategy of "zeroing in" emerged from the study which may serve as a useful mobility training device, as an adjunct to posture and mobility training.

The maintenance of upright posture is essential to mobility and orientation for the blind. Sighted individuals use vision to orient themselves in the environment, while blind individuals must rely on proprioceptive and vestibular cues in order to orient. Schiltz (1973) defines orientation as the establishment of one's position in relation to the environment and significant objects. Mobility is the ability to move safely, efficiently and effectively through the environment (Lowenfeld, 1973; Warren & Kocon, 1974; Schlitz 1973). Warren & Kocon (1974) point out that when vision is limited, good posture helps keep a stable correspondence between the body and environment. To the extent that blind people have postural difficulties, their perception of vertical may be inadequate. Poor posture effectively removes the stable correspondence between body and environment, thus making mobility more difficult.

Siegel and Murphy (1970) suggest that postural defects inhibit efficient gait and cane use, proving detrimental to effective mobility. They recommend increasing proprioceptive and vestibular awareness in the blind because information from the tendons, joints and semicircular canals supplant the ocular coordination used by the sighted to maintain good postural balance. Siegel and Murphy also reported that blind subjects had a poor concept of vertical. Using a vertical meter they tested a subject's tactual and intellectual concept of the vertical. Their verticalmeter was a four-foot, hollow aluminum tube attached to a wooden base through a ball and socket joint. Subjects in their study reported errors of five to thirty-five

degrees in the anterior, posterior, and lateral planes.

The blind have been suspected of having special compensatory ability to perform proprioceptive tasks. Conflicting evidence exists on this issue. Researchers such as Cratty (1966), Hunter (1954), Fisher (1964) found support for the claim that blind can use proprioceptive information more effectively than the sighted, while others like Rivenes and Cordellos (1970) and Bottrill (1969) did not find differences in performance between the two populations. Part of the difficulty in reaching a concensus on this matter lies in the fact that some investigators used gross motor tasks while others used fine motor tasks. The difficulty is reinforced in light of Siegel and Murphy's results which, as previously stated, showed that the blind have a poor concept of the vertical. The task used by Siegel and Murphy was a fine motor test of determining the vertical position.

If postural problems do relate to poor mobility then a gross motor task which tests the ability to accurately judge the body's vertical orientation in space might provide some insight into the controversy. If blind subjects are more sensitive to proprioceptive cues, they should do better on a task of judging the body's position in space than sighted blindfolded subjects and legally blind subjects who are also blindfolded. Due to the importance of the ability to use proprioceptive cues in mobility for the blind, the ability to judge the vertical position has functional significance to mobility and may be a trainable function.

The purpose of this paper is to present research findings relating to the ability to assume the vertical position between blind and sighted children.

Description of the Sensitivity to the Upright Position Task

In order to assess the ability to assume the upright position, a chair was built following the examples of Witkin (1949) and Fleishman (1953). The chair, as shown in the photograph in Figure 1, was mounted securely onto the stabilometer plat-

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Insert Figure 1

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form at right angles to the plane of rotation. The chair's weight was equally distributed on both sides of the stabilometer axle. (The stabilometer was a balancing platform, 2 feet by 4 feet, suspended 10 inches below a horizontal axle. It moved through a range of twenty degrees from left to right). A slow motor drove the platform by means of detachable cables, and a hand control switch enabled the subject to adjust the position of the platform by disengaging the motor. Twenty degrees of tilt were possible, ten to the right and ten to the left. For safety, a seat belt and shoulder harness were used to secure the subject in the chair. An adjustable head restraint held the head in the midline position. Fleishman (1953) found greater precision of adjustment to the upright when the head position was fixed.

With the platform in the horizontal position, the child was seated in the chair and the safety equipment was fastened.

Figure Caption

Figure 1. Sensitivity to the Upright Position Task

This initially placed the child's head and trunk exactly in the upright position. Each child was blindfolded for this test and given the hand control so he could practice moving the board to the right and left and also stopping it at will. Once acquainted with the procedure, the child was asked to move the hand switch to the left and hold it there until the board moved all the way to the left. The child was touched lightly on the left shoulder to indicate the left direction. Once the board stopped at the left side, the child was asked to reverse the switch bringing the board back to the right. He was asked to use the manual control to stop the board's movement when he felt he was sitting straight up. Following recording of the measurement error in degrees off center, this procedure was repeated with the child being asked to move the board all the way to the right. Six trials, alternating to the left and right were given. Pilot study data indicated that six trials were optimal before boredom became a factor. Deviations to the right and/or left of vertical (constant error-Dobbins & Rarick, 1977, constituted the score on each trial.

Description of Subjects

A total of forty-eight children participated in the study, six within each of the four visual categories at each of two age levels. The age levels were: Pre-adolescent boys and girls, aged 8-10 years; and adolescent boys and girls, aged 12-14 years. Within these two age levels there were children who fell into the following visual categories.

Totally blind - The group of totally blind children were blind prior to two years of age, with vision limited to light perception or light projection.

Legally blind - The group of legally blind children met the California State Department of Education (1970) definition: a) visual activity in the better eye after best correction of 20/200 or less, or b) visual loss so severe that for educational purposes, vision cannot be used as a major channel of learning.

Sighted - The group of sighted children had vision within the normal, correctable range.

Based on reports from school officials, all children included in this study were reported to be intellectually normal with no physical impairments other than loss of vision. All blind subjects, with the exception of two of the older legally blind boys, lived at home.

Limitations in Acquiring Blind Subjects

The population of totally blind and legally blind children is very small within the desired ranges, particularly those who are not multiply handicapped. The definition of visual impairment groups therefore excludes any distinction for visual field because further narrowing of the groups would have made data collection and analysis very difficult. Sample sizes were expected to be small and to require the use of nonparametric statistical analysis.

Results and Discussion

Mann-Whitney U comparisons (Siegel, 1956) were calculated

between the blind and sighted subjects. This nonparametric statistical method was used because of the small sample size and the non-normality of the distribution. The results of the group comparisons are reported in Table 1. There were no significant differences between the groups ($U \leq 7 \propto .05$).

The lack of significant differences between the groups in ability to assume the vertical position has interesting implications. No work has been reported in the literature on the ability of children to perform such a task. Witkin (1949), whose chair design was used as a model for the apparatus in this experiment, had reported on blindfolded sighted adults who, on a task similar to the one in the present study, were accurate to within one degree to the left or right of center. Siegel and Murphy (1970) reported poor performances from 5 to 35 degrees from center in blind adults. Since both blind and sighted children performed equally poorly on the task in the present study, the ability to assume the vertical position may be a post-adolescent development. Table 2 shows the mean degrees off center to the left and right for each group. While the differences were not significant between the groups, the mean error scores for the older children were lower than the scores for the younger children in their respective groups. This finding lends support for the proposal that ability to accurately assume the vertical position is a post-adolescent development.

In addition, it is possible that a particular strategy must be learned in order to perform the task accurately.

Learning the strategy may be part of the developmental ability previously proposed. During pilot test of the equipment it was noted that adults moved the chair to the right and left many times in small increments as if to "zero in" on the upright position. During the actual testing with the children, only four of the forty-eight children used this "zeroing in" strategy. The rest of the children moved the chair from the tilted position to what they thought was vertical in one or two stops. The inability of children to utilize this "zeroing in" technique, whether due to developmental or other reasons, may have resulted in the lack of performance differences between the groups.

While no significant differences were found to support the original rationale for the investigation, interesting developmental data was uncovered which warrants further investigation. Cross-age testing is needed probably through age 25 to determine when the ability to assume the upright position develops. In addition, if it can be demonstrated that blind children can learn to use this zeroing in strategy, there may be interesting implications for posture and mobility/orientation training.

Table 1

Between Group Comparisons Using Sensitivity to the Upright Position Test

(Mann-Whitney U Values)

Group	Sensitivity to the Upright Position Initial Test	Sensitivity to the Upright Position Retest
Totally Blind Young vs. Sighted Young	9.0	13.5
Totally Blind Old vs. Sighted Old	27.5	19.0
Legally Blind Young vs. Sighted Young	21.0	16.5
Legally Blind Old vs. Sighted Old	25.0	18.0

*Significant $\alpha .05$ if $U \leq 7$.

Table 2

Group Means for Degrees Off Center to the Left and to the Right on the Sensitivity to the Upright Position Test

	Left	Right
Totally Blind		
8-10	4.88	3.50
12-14	2.90	3.35
Legally Blind		
8-10	3.51	3.03
12-14	3.32	2.77
Sighted Blindfolded		
8-10	3.45	3.30
12-14	2.41	1.48

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